

Fort Hall Resident Fish Program

Habitat Improvement in Fort Hall Bottoms

Annual Report
1999



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Fort Hall Reservation Stream Enhancement 1999 Annual Report

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ABSTRACT

Habitat enhancement and protection were the main focus of the Resident Fish Program during 1999. Enhancement and protection included anchoring 1,327 m of evergreen tree revetments and erecting three kilometers of exclosure fence. Physical sampling during 1999 included sediment and depth surveys and chemical measurements. Baseline SADM's, used to track changes in channel morphology and specifically track movements of silt through the system were completed for eight strata in Big Jimmy Creek.

Biotic sampling included a genetic survey of salmonids on the Fort Hall Reservation. In addition, density and biomass of fish in select Bottoms streams was monitored. Numbers of fish in Clear creek were much lower than previous years. In addition, numbers of fry counted at Broncho Bridge were significantly lower than previous years. Future monitoring will determine whether low numbers are cyclic and related to weak year classes or low numbers are the result of anthropogenic influences.

Permit fishing seasons continued to provide a source of income for the Tribes and an opportunity for non-tribal members to fish Bottoms streams. Mean catch rate by anglers on Bottoms streams increased from that of previous years to 1.02 fish per hour.

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INTRODUCTION

The primary goal of the Resident Fisheries Program (RFP) is to restore, enhance, and protect Fort Hall Reservation streams so they can support native fish populations at historic or expected levels. Streams on the Fort Hall Reservation have been negatively affected (i.e. streambank failures) by a variety of sources, including; livestock grazing, American Falls Reservoir construction and operations, and the 1976 Teton Dam collapse. Cattle, bison, and horses have been present on the Fort Hall Reservation since the early 1800's (personal communication, Tribal elders). Streambank failures on Reservation streams are a serious problem affecting aquatic biota through changes in habitat quality. Negative impacts from streambank failures include: widened channels, a reduction in riparian vegetation and instream cover, increased summer water temperatures, and deposition of fines on critical spawning gravel.

In 1992, the RFP, by cost-sharing Bonneville Power Administration and Bureau of Indian Affairs projects, began large-scale, low-tech, habitat restoration projects on the Fort Hall Reservation. Restoration was directed at stabilizing eroding banks, deepening and narrowing channels, and restoring diversity to the spring-stream environment. Restoration efforts were originally focused on Clear Creek, a heavily impacted Reservation stream. The RFP has also directed efforts toward other Reservation streams, including: Spring, Diggie, and Big Jimmy creeks. The primary focus of restoration has changed over the course of the project, in particular less reliance on in-stream structures and more reliance on exclosure fencing and natural healing processes. Work done in 1999 involved physical and biotic assessments of project locations; development and implementation of fencing projects; placement of habitat structures to control sediment; improving water quality and bank stability, and providing cover for fish. As in 1994, 1995, 1996, 1997, and 1998 skilled-labor crews of the SalmonCorps were cost-shared into the habitat restoration effort.

The assessment of past habitat restoration successes and failures is imperative to the efficacy of any habitat improvement project. Fish population trends were monitored using electrofishing estimates and snorkeling. Silt And Depth Measurement (SADM) surveys, developed by the RFP for low-gradient spring creeks, continued to be used to assess changes in channel characteristics on treatment and control areas of streams on the Fort Hall Reservation.

Habitat affects many aspects of trout biology and ecology including abundance, survival, migration, and reproduction (Behnke 1992). However, other factors such as water quality can also affect those processes (Sprague 1990). Five water quality parameters were monitored throughout the Fort Hall Reservation in 1999 (DO, Conductivity, TDS, pH, and Temperature).

DESCRIPTION OF PROJECT AREA

The Fort Hall Indian Reservation, located in southeastern Idaho, is drained by more than twenty streams (Figure 1). Of particular importance, are streams in the Fort Hall Bottoms, which is a large wetland lying adjacent to the Snake River near its entrance into American Falls Reservoir. These streams are all spring fed, low gradient, and relatively short in length.

Of the four primary Bottoms streams, Spring Creek is the largest ($12.75 \text{ m}^3/\text{s}$ and approximately 15 km in length)(Figure 2) and Clear Creek is the second largest ($4.5 \text{ m}^3/\text{s}$, approximately 11

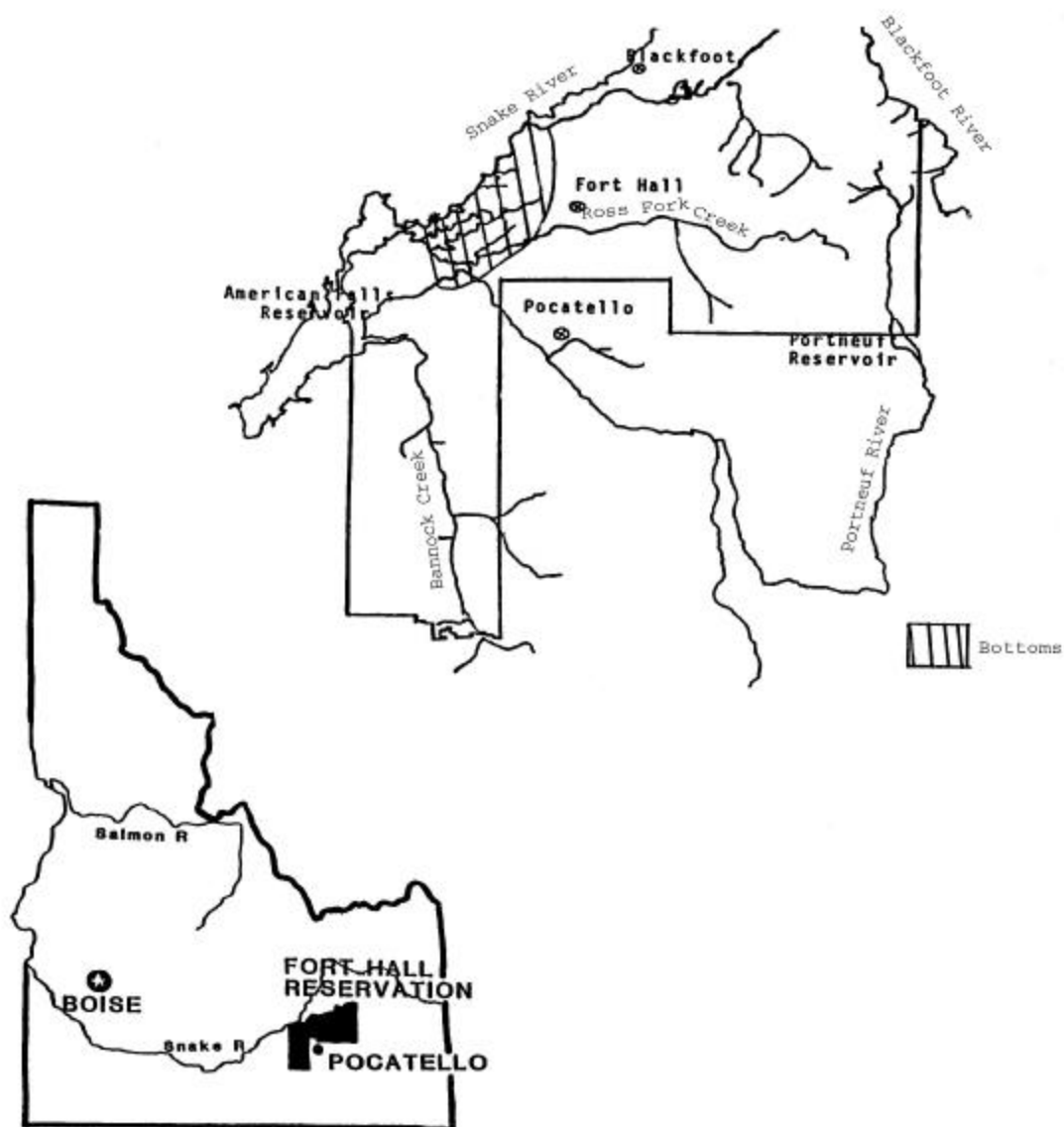


Figure 1. Location of the Fort Hall Indian Reservation.

km in length)(Figure 3). The Bottoms streams provide critical wintering, spawning, and nursery habitats for adfluvial and resident salmonids (Taki and Arthaud 1993). Wintering and nesting waterfowl, shorebirds, and raptors also heavily use the streams, lateral springs, and surrounding marshlands. Endangered bald eagles and trumpeter swans winter, nest and fish on the Bottoms.



Figure 2. Map of Spring Creek showing project locations.

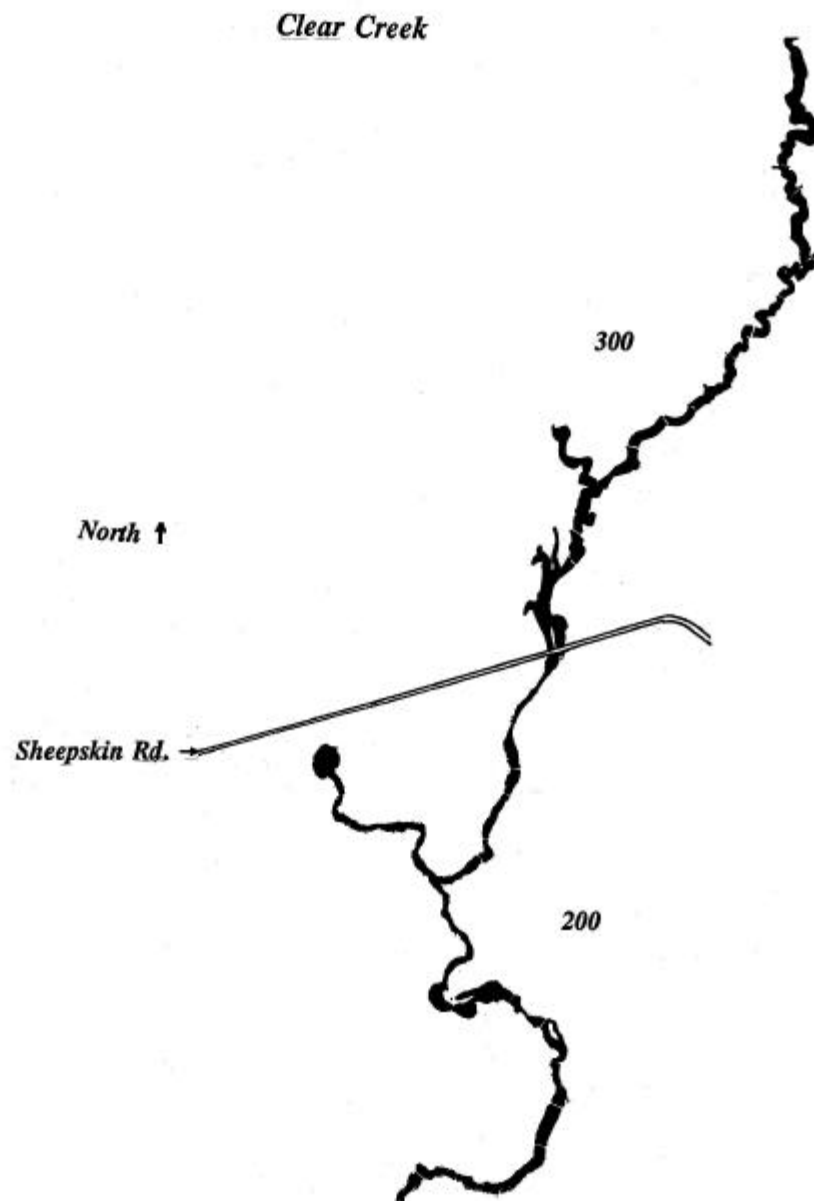


Figure 3. Map of Clear Creek showing 200 and 300 series.

METHODS AND MATERIALS

Habitat Enhancement/Protection

Salmonid and interdependent species habitats were directly enhanced with riparian protection, including; enclosure fencing and evergreen revetments. Most streams on the Fort Hall Reservation support reduced populations of hybridized salmonids. Major limiting factors include a lack of spawning gravels and juvenile cover. In 1999, the RFP installed 1,327 meters of evergreen revetments. Evergreen revetments have been shown to provide much-needed cover for salmonid fry. In addition to fish cover, revetments help trap fine sediment and reduce lateral scour of sensitive streambanks. As in the years 1992 to 1998, anchoring evergreen tree revetments was a priority task during 1999. Christmas tree dealers from Pocatello donated all trees. Evergreen revetments which had decomposed above and below Broncho Bridge (Spring Creek) were completely replaced in 1999. New revetments were placed inside old revetments which had become inundated with silt. By placing new revetments inside old revetments a gradual narrowing of the Spring Creek channel has occurred. Revetments were anchored with natural twine and willow poles. Revetments serve three purposes; protecting banks from scouring flows, deposition of sediment, and providing cover for juvenile salmonids (Wesche et al. 1985; 1987).

In 1999, approximately three kilometers of jack and rail fencing was erected on the headwaters of Ross Fork Creek to protect sensitive riparian areas and encourage proper riparian growth. Analysis of past data collected from enclosure projects shows the ability of stream ecosystems to heal naturally given time and removal of causative agents (e.g. grazing and reservoir influences). In addition, previously constructed livestock enclosure fences were repaired/maintained to protect project work and critical riparian areas on Clear Creek. Fences were also repaired around banks that had been sloped on Spring Creek and along other banks that were

previously fenced. All fences on the Bottoms required frequent patrolling and repair throughout the year. Analysis of past data collected from exclosure projects shows the ability of stream ecosystems to heal naturally given time and removal of causative agents (e.g. grazing and reservoir influences). The Resident Fisheries Program obtained additional funds for jack and rail fence in 1999. Two kilometers of fence was purchased in June and will be erected during 2000 on Ross Fork and other creeks.

Physical Sampling

SADM surveys. - Levels of silt, water depth, and stream width (SADM's) were measured in the 200 series of Big Jimmy Creek (Figure 4). SADM data has been collected from this section of Big Jimmy since 1996 (Arthaud et al. 1996). SADM data were collected from eight strata of Big Jimmy Creek. Comprehensive surveys of Big Jimmy were completed in 1996; data was collected this year to monitor changes in silt levels after the spring flooding of 1997 (see Moser and Colter 1997).

Chemical Measurements. - Five water quality parameters were monitored (dissolved oxygen, conductivity, total dissolved solids, pH, and temperature) in 1999. Monthly monitoring data is presented from November 1998 to September 1999. Sites were selected such that many streams were sampled at one location and some streams were sampled at two to three locations along their length. Sampling times varied but all measurements were taken between 0600 and 1800.

Big Jimmy Creek



Figure 4. Map of Big Jimmy Creek. (200 series is area of creek above Wood Bridge).

Water Temperature. - Stowaway® temperature recorders were placed in Clear Creek (300

series), Big Jimmy Creek (Wood Bridge), Jimmy Drinks Creek (Corrals), and two sites in Spring Creek (Sheepskin and Cable Bridges). Recorders were set to measure hourly from April to October of 1999. Temperature data was analyzed and presented as maximum, average and minimum daily water temperature.

Biotic Sampling

Fish Populations. - Fish populations were monitored in Spring Creek (Figure 2) and Clear Creek (Figure 3). A Smith-Root electrofishing boat, a tote barge, a backpack electrofisher, and snorkeling equipment were used to collect data in Bottoms and mountain streams. A one-pass estimator of population size was used to save time, money, and reduce stress to fish (Arthaud and Taki 1994b). Numbers of young-of-the-year (YOY) fish were surveyed by snorkeling in Spring Creek (Malvestuto 1983). Data collected was analyzed in terms of fish species composition, size class, and density per 100m² of stream.

Genetic Sampling. - In 1999, a genetic survey of salmonid resources was begun on the Fort Hall Reservation. The RFP seeks to determine the level of genetic introgression on Reservation streams to better assess what steps are needed to restore native populations of Yellowstone cutthroat trout (*Oncorhynchus clarki bouvieri*) to their historic locations and densities. Genetic samples were collected from 13 different streams throughout the Fort Hall Reservation. Twenty-five fin clips were taken from individual fish at each collection site. Samples were preserved in 95% ethyl alcohol and shipped to the University of Montana Genetics Laboratory. Samples were taken from sites as far up drainages as possible to increase the likelihood of collecting pure strains of Yellowstone cutthroat trout. Fish were anesthetized using MS-222® measured, fin clipped, and returned to the stream. Water temperature and electrofishing effort was recorded, elevation, and a GPS readings were taken at each site. Collections were made at the following sites; Spring Creek, Big Jimmy Creek, Clear

Creek, Ross Fork Creek, South Fork Ross Fork Creek, Little Toponce, North Fork Toponce, Mill Creek, Moonshine Creek, Sawmill Creek, Rattlesnake Creek, Midnight Creek, West Fork Bannock Creek. Other creeks were sampled but contained no hybrids, rainbows, or cutthroat x rainbow hybrids.

RESULTS AND DISCUSSION

Habitat Enhancement/Protection

Vegetation Planting. - During spring 1999, new willow planting techniques were tested on Spring Creek at Doug's slopings. Sixty whole willow shoots were planted within an enclosure at Doug's slopings. These plantings will be monitored for over-winter survival before the technique is expanded to other Reservation areas. Table 1 shows survival counts for willow pole cuttings, and wattles at habitat enhancement sites on Spring and Clear creeks. Percent survival of over-wintering willows ranged from a low of 0% to a high of 21%. Over-winter Survival of willow plantings appears to be variable and site specific, yet is increasing from past years because of improved planting methods (Arthaud et. al. 1995), particularly planting of willows at least 1" in diameter.

Table 1. Location, numbers, and survival of willow shoots, poles, and wattles planted during 1994, 1995, 1996, 1997, and 1998. Counts were made on 9/15/99-9/20/99.

	Cumulative Plantings	Alive	Dead	Missing	Survival
<i>Spring Creek</i>					
1st Pool 300	270	22	114	134	8%
2nd Pool 300	1158	72	231	855	6%
Russian Olive 300	102	3	85	14	3%
Shoemaker	1163	6	50	1107	1%
Turnoff to Sucker Weir	166	35	75	56	21%
Bend on Spring Creek	608	108	290	210	18%
Upper Island	305	34	35	236	11%
Above Upper Island	1215	5	620	590	0%
Cut Bank Above Upper Island	175	0	65	110	0%

Revetments. - On Spring Creek above and below Broncho Road in Section 500-600, evergreen tree revetments were anchored along 1,327 m of streambank. Most of the original revetments placed in this area in 1991 were replaced in 1999.

Fencing. - During 1999, approximately 3 km of jack and rail fence was erected on the headwaters of Ross Fork Creek (Figure 5). The headwaters of Ross Fork Creek is fed by a large artesian spring. Consequently, water quality is excellent and fish populations are at or near carrying capacity. Exclosure fencing on Ross Fork Creek will protect and improve fish and wildlife resources in the headwaters and improve water quality downstream to American Falls Reservoir.



Figure 5. Photograph of Jack and Rail fencing on Ross Fork Creek (October 1999).

Physical Sampling

SADM surveys. – SADM data was collected in the 200 series of Big Jimmy Creek. Figure 6 shows average silt depth and max silt depth data collected in 1996, 1998, and 1999. Six of eight strata showed a decrease each year in average and maximum silt measurements since the flooding of 1997. Positive effects from flooding (i.e. movement of sediment) appear to be occurring two years post flood.

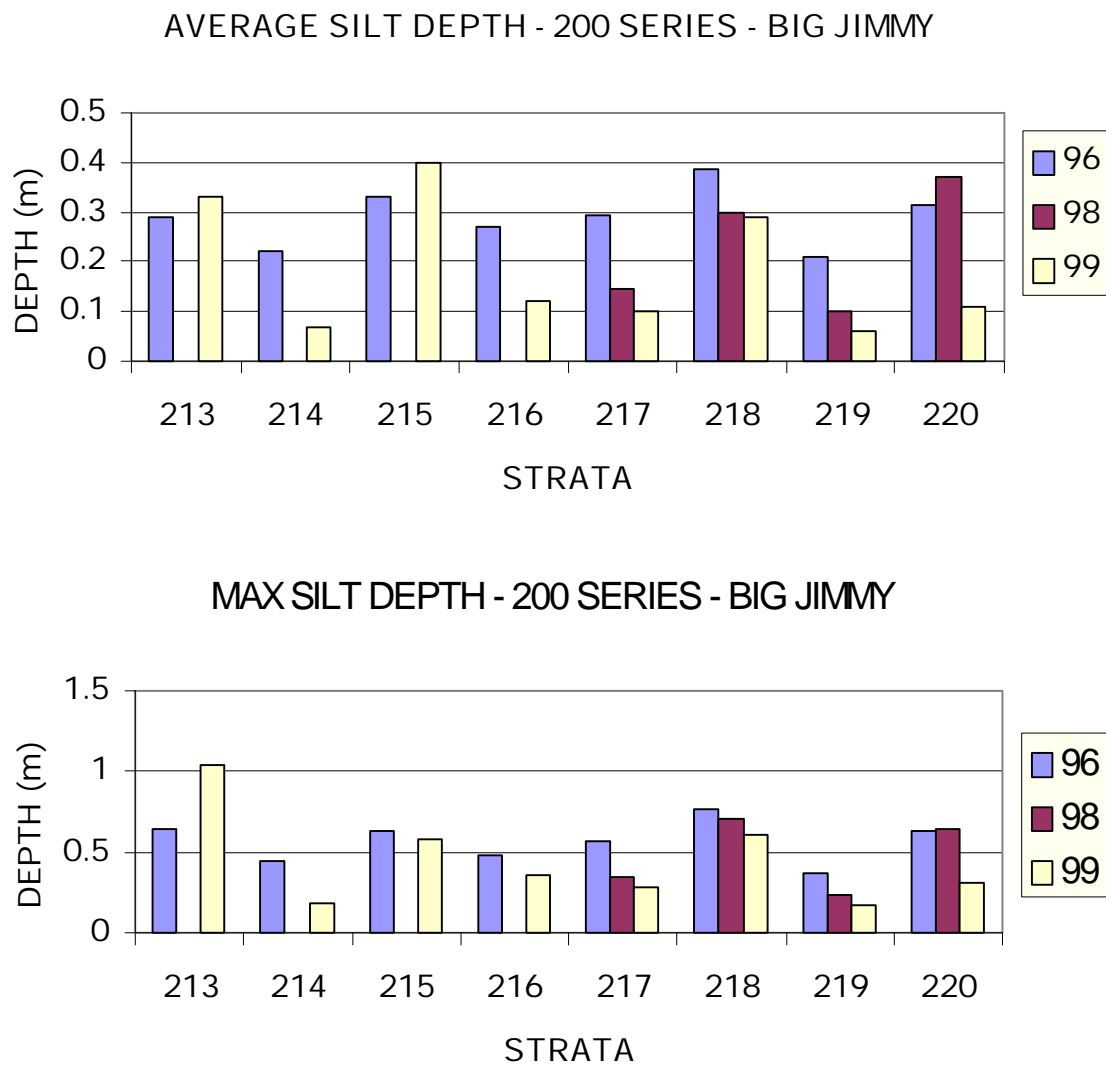


Figure 6. Average and maximum silt depth in 8 strata of Big Jimmy Creek, 1996, 1998, 1999.

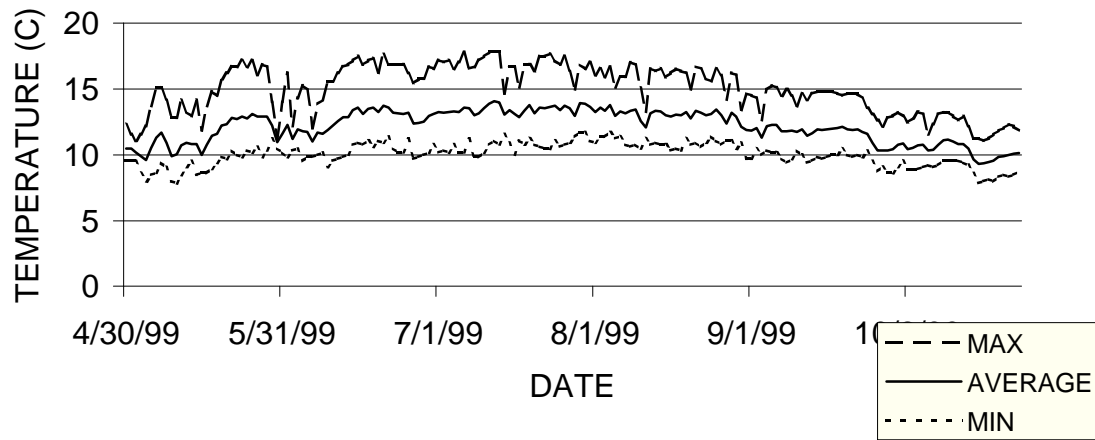
Chemical Measurements. - Chemical measurements were recorded on 10 different occasions during 1999. Measurements were taken on all major Bottoms streams (Table 2). During 1999 dissolved oxygen ranged from 5.5 to 15.8 mg/l, conductivity ranged from 94.8 to 623 μ mhos, TDS ranged from 98 to 905 mg/l, and temperature was measured from -0.1 to 22.2 C. Measured pH was consistently slightly alkaline, ranging from 7.0 to 9.2.

Water Temperature. – Stream temperature was recorded in two sites in Spring Creek (Sheepskin and Cable Bridges)(Figure 7), Clear Creek (300 Series), Big Jimmy Creek (Wood Bridge), and Jimmy Drinks Creek (Corrals) (Figure 8). Temperature data is presented as maximum, average and minimum daily water temperature (Figures 7 and 8). Temperatures reached lethal levels (>22 C) for short periods of time in Clear Creek and Big Jimmy Creek during 1999. However, many fish may avoid these lethal temperatures by finding cool water refugia in deep pools and undercut banks. Temperatures in Spring Creek were optimal throughout the year.

Table 2. Maximum, average, and minimum chemical measurements recorded at various Fort Hall Reservation locations from 11/6/98 to 9/29/99 (n=9 for all sites).

Stream (at)	Measurement	Temp. (° C)	p.H.	Conductivity (µS)	TDS (mg/L)	D.O. (mg/l)
Big Jimmy (Wood Bridge)	maximum	20.4	8.2	455.0	575.0	14.6
	average	12.8	7.9	382.8	495.1	10.9
	minimum	6.2	7.5	127.0	120.0	8.3
Clear Cr. (Sheepskin Rd.)	maximum	18.0	8.8	446.0	565.0	15.3
	average	13.0	8.1	384.7	497.6	11.1
	minimum	7.7	7.7	108.1	120.0	7.8
Diggie Cr. (Fisher Feedlot)	maximum	14.2	8.2	375.0	496.0	11.0
	average	12.3	7.7	335.9	445.7	9.0
	minimum	10.9	7.4	103.0	103.0	6.5
Gibson Drain (Sheepskin Rd.)	maximum	22.0	8.5	680.0	905.0	13.8
	average	13.2	8.1	350.2	455.3	10.5
	minimum	0.6	7.6	142.5	157.0	7.6
Jeff Cabin (Culvert)	maximum	19.7	8.1	476.0	591.0	13.4
	average	12.9	7.9	389.0	515.8	10.7
	minimum	6.7	7.4	133.0	125.0	7.9
Jimmy Drinks (Boat Ramp)	maximum	17.6	9.0	434.0	526.0	12.4
	average	13.5	8.2	353.5	452.8	10.4
	minimum	9.0	7.7	94.8	105.0	7.9
North Canal (Broncho Rd.)	maximum	21.5	8.5	348.0	683.0	11.5
	average	14.4	7.9	290.1	387.3	8.4
	minimum	9.5	7.5	100.0	99.0	5.8
Portneuf (Boat Ramp)	maximum	18.4	8.8	606.0	769.0	12.0
	average	13.2	8.1	469.9	608.9	9.6
	minimum	7.3	7.5	140.7	155.0	7.1
Portneuf (Siphon Rd.)	maximum	17.3	8.5	623.0	783.0	11.0
	average	11.7	7.9	475.8	622.1	9.3
	minimum	6.9	7.0	142.8	157.0	7.1
Ross Fork (Rio Vista Dr.)	maximum	19.5	9.1	410.0	607.0	11.6
	average	12.8	8.1	354.4	464.0	8.8
	minimum	7.7	7.5	113.2	125.0	7.0
Ross Fork (Foothills)	maximum	17.7	8.5	598.0	487.0	12.4
	average	9.7	8.1	306.6	354.7	10.4
	minimum	0.2	7.3	184.2	104.0	7.8
Ross Fork (Siler Rd.)	maximum	22.2	9.2	395.0	580.0	12.4
	average	12.8	8.3	293.6	385.1	10.0
	minimum	-0.1	7.8	106.8	118.0	6.3
Spring Cr. (Cable Bridge)	maximum	15.1	8.8	372.0	509.0	15.8
	average	11.2	8.2	322.5	440.6	10.7
	minimum	7.9	7.9	96.8	107.0	8.1
Spring Cr. (Sheepskin Rd.)	maximum	15.9	8.8	372.0	497.0	15.7
	average	12.1	8.2	328.0	437.1	10.9
	minimum	8.9	7.8	94.1	104.0	8.3
Spring Cr. (Broncho Rd.)	maximum	12.5	8.1	341.0	474.0	10.0
	average	11.3	7.6	305.7	408.8	7.8
	minimum	10.4	7.0	98.5	98.0	5.5

SPRING CREEK - SHEEPSKIN - 1999



SPRING CREEK - CABLE - 1999

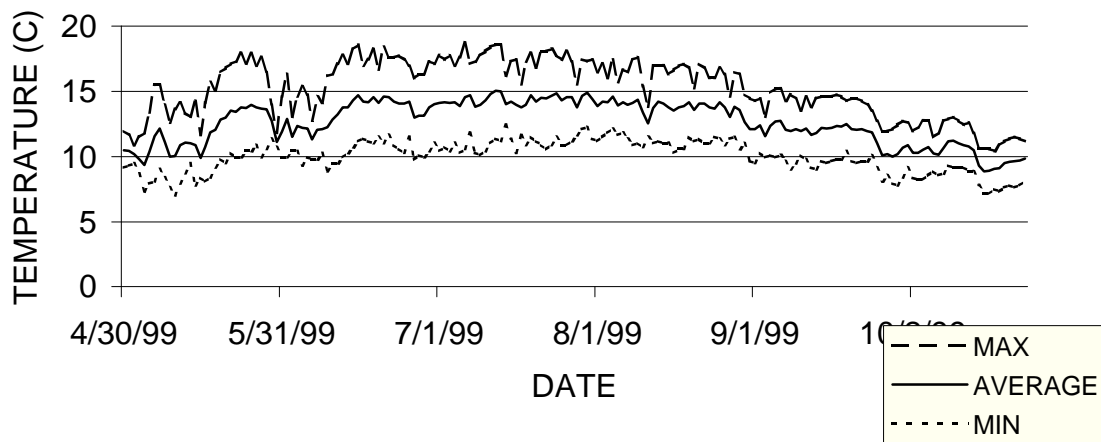
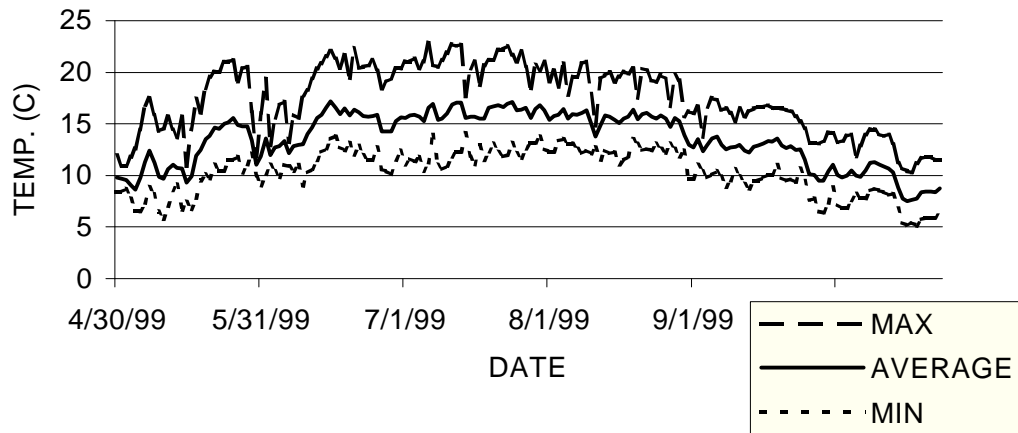
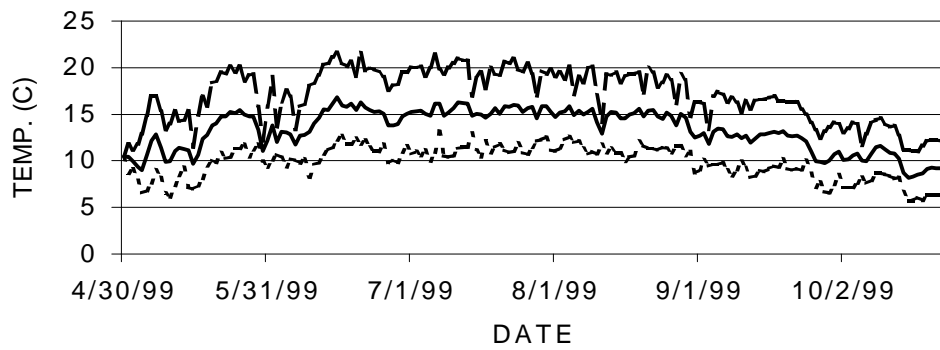


Figure 7. Maximum, average and minimum temperatures from two sites on Spring Creek. 4/30/99 to 10/24/99.

BIG JIMMY - 1999



CLEAR CREEK 303 - 1999



JIMMY DRINKS - 1999

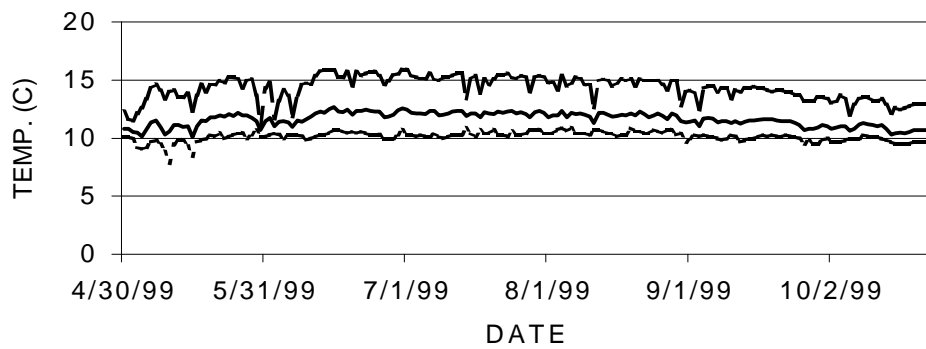


Figure 8. Maximum, average, and minimum temperatures from Big Jimmy, Clear Creek, and Jimmy Drinks. 4/30/99 to 10/24/99.

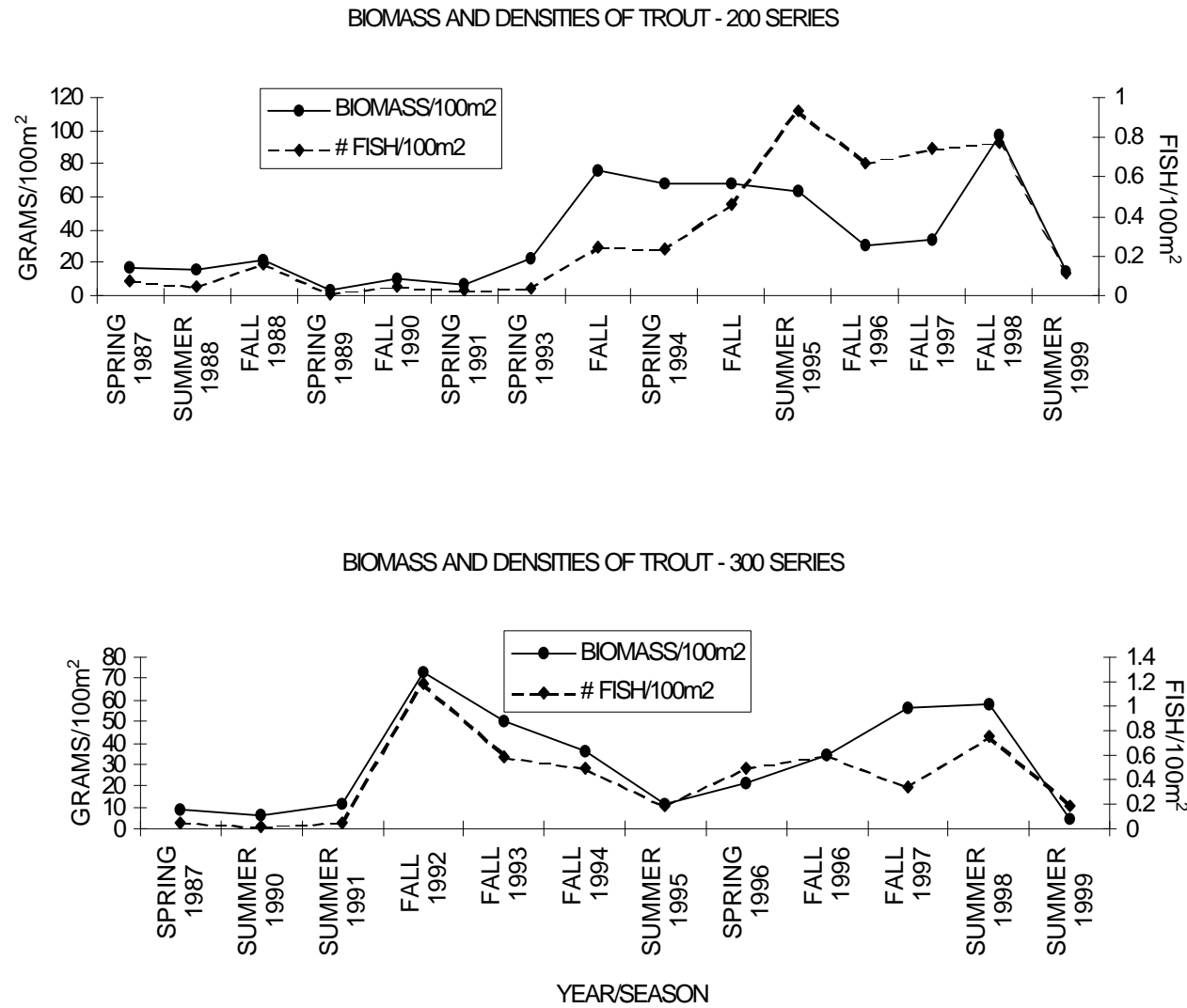


Figure 9. Estimated biomass and densities of wild trout sampled in Clear Creek from 1987 to 1999.

Biotic Sampling

Fish Populations. - Clear Creek fish sampling data from 1987 to fall 1999 was summarized in Figure 9 to show abundance and biomass trends of wild salmonids. After habitat work began in spring 1992, wild trout populations and their biomass increased for both Section 200 and 300 (Figure 9). Densities and biomass of wild trout in the 200 and 300 series of Clear Creek were at very low levels in 1999. Future monitoring will determine whether low numbers

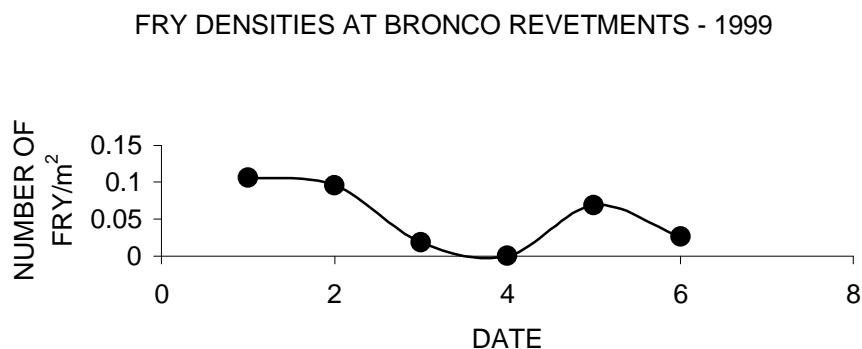


Figure 10. Fry densities at Broncho revetments from May - June 1999.

are cyclic and related to weak year classes or low numbers are the result of anthropogenic influences (i.e. overfishing).

Tree revetments in Spring Creek near Broncho Bridge were snorkeled on seven occasions in 1999. Fry counts have ranged from a low of 13 in 1991 (Taki and Kutchins 1991) to a high of 470 last year. Counts during 1999 were lower than previous years. Low numbers could be the result of a weak year class, over-harvest of spawners, or fry emergence occurring at a different times of the year.

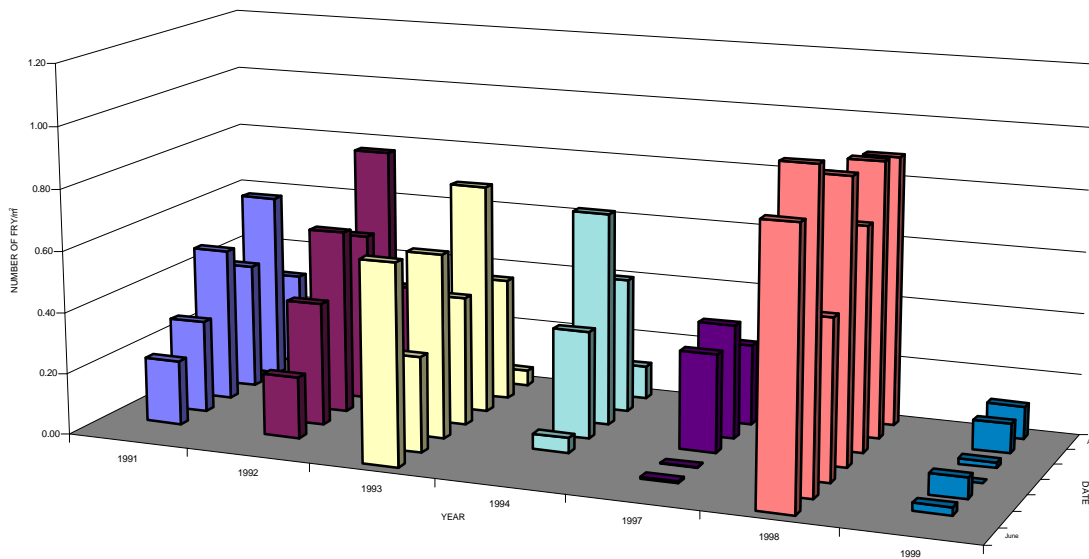


Figure 11. Fry densities at Broncho Bridge Revetments from 1991 to 1999.

Revetments were initially placed in 1991 and completely replaced in spring of 1999. Figures 10 and 11 show number of fry counted during 1999 and number of fry counted from 1991 to 1999, respectively.

Genetic Sampling. - Table 3 shows information from 22 streams that genetic samples were collected from in 1999. Fourteen of the 22 streams had hybrids (rainbow x cutthroat), rainbow trout, cutthroat trout or combinations of the three. Genetic data collected in 1999 was sent to the University of Montana for analysis to be completed in 2000. Only one stream (Mill Creek) had a population that appeared to be pure Yellowstone cutthroat trout. Catch per hour (electrofishing effort) ranged from a low of 25 in Spring Creek to a high of 369 in Midnight Creek. There appeared to be no correlation between habitat quality and numbers of fish. The most pristine,

remote stream sampled had no Yellowstone cutthroat or hybrids, but had very high densities of Brook Trout (*Salvelinus fontinalis*). More streams will be sampled in late 1999 to 2000. If pure Yellowstone cutthroat trout are found protective measures will be enacted to preserve those populations from genetic introgression (weirs) and habitat degradation (fencing).

Table 3. Genetic sampling sites, species, number, location, temperature, catch per hour, effort, and elevation collected during summer, 1999.

STREAM	SPECIES	NUMBER	HYB/CUT/RBT	LOCATION	TEMP. (C)	CPH	EFFORT (s)	ELEV. (ft)
Big Jimmy	HYB, SUC	25		Above Wood Bridge	19	103	873	4300
Birch	HYB	9		Crossing	9	29	1101	5200
Clear	HYB	25		201-216	12	64	1400	4300
Little Toponce	HYB	31		Above Ponds	13	177	629	6800
Midnight	HYB	25		Boundary	16	369	244	5000
Mill	CUT	25		Crossing	8.5	37	2465	7300
Moonshine	HYB	25		Powerlines	14	180	500	4700
North Toponce	HYB	25		Length of Stream	8	34	2667	7700
Portneuf/Chesterfield	RBT,SUC,DAC	1		Mouth	20	14.5	250	5400
Rattlesnake	HYB, SUC	25		Boundary	19	202	446	4300
Ross Fork	HYB	25		Twitchell Meadows	10	213	422	5700
South Fork Ross	HYB,BRK,SUC	32		Crossing	10	231	498	5500
Spring	HYB,SUC,RBT	25		Cable, Shoemaker	16	25	3600	4380
WF Bannock	HYB	25		Above Exclosure	12	140	644	5100
Lower Moonshine	SUC,DAC,RSS	0		Mouth	22	NA	NA	4800
Squaw Creek	No Fish	0		Midpoint	>20	NA	NA	5076
Lower/Mid Jeff Cabin	SUC,DAC,RSS	0		Lower/Mid	17	NA	NA	5660
Garden Creek	No Fish	0		High	11	NA	NA	4800
Cold Creek	No Fish	0		High	12	NA	NA	5390
Upper Portneuf	DAC	0		High	>16	NA	NA	5685
Wood Creek	No Fish	0		Midpoint	16	NA	NA	5600
30-Day	BRK	0		High	10	NA	NA	7400

CUT=Cutthroat trout; HYB=Cutthroat X Rainbow Hybrid; BRK=Brook Trout; RBT=Rainbow Trout; SUC=Sucker spp.; DAC=Longnose Dace; RSS=Redside Shiner.

Creel Survey

Permit and tribal member anglers on Spring Creek were surveyed at random times throughout the summer. Figure 11 shows catch per hour data from 1987 to 1999. Season catch rates were higher than 1996 and 1997 at 1.2 fish/hr. Angler satisfaction remained high and surveys indicated anglers appreciated the uncrowded conditions, the chance to catch a trophy trout, the challenge of fishing highly selective yet visible trout, and the opportunity to fish for native cutthroat.

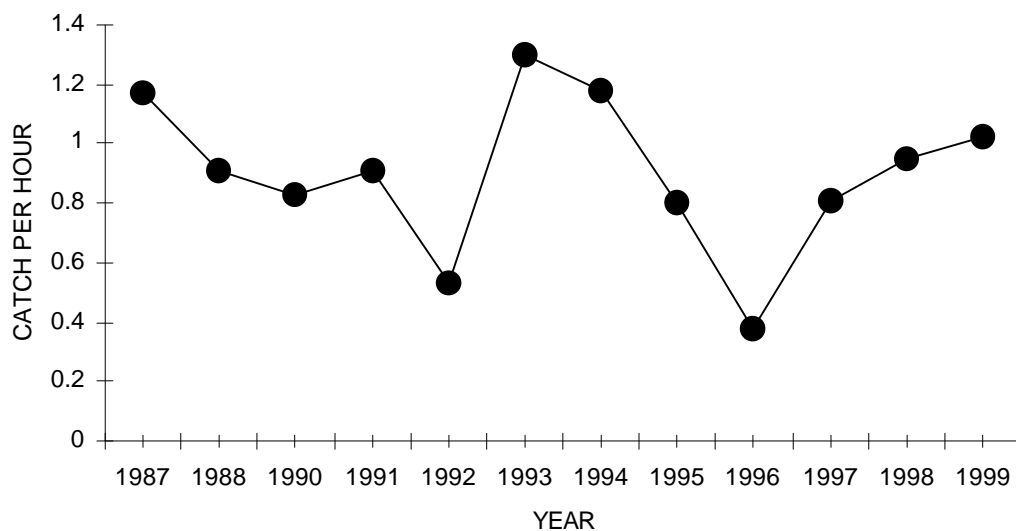


Figure 12. Catch per hour on Spring Creek for the years 1987-1999

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